part of #7

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Timothy E. Dickson
Serial No. 09/494,897
Filed: January 31, 2000
For: **FRAUD DETECTION THROUGH FLOW RATE ANALYSIS**

Examiner: Von Buhr, Maria N.
Art Unit: 2125

Commissioner for Patents
Washington, D.C. 20231

Sir:

DECLARATION UNDER RULE 37 CFR 1.131

I hereby declare that:

1. My name is Steven N. Terranova, and I was employed by Gilbarco Inc. from 1994-1999. Further, I was employed as an in-house patent attorney for Gilbarco in 1999 to manage intellectual property matters. I was subsequently employed by the law firm of Coats and Bennett, PLLC starting in November 1999.

2. I have personal knowledge of the facts surrounding the diligence of the present invention and the facts surrounding the process, which culminated in the filing of the present application.

3. On April 21, 1999, I received the Patent Memoranda (PM) 9914 from Timothy Dickson, the inventor (Exhibit A). Specifically, the second and fourth bullet points of PM 9914 illustrate the concept of the present invention.

4. I discussed PM 9914 with Timothy Dickson in May 1999 to understand the invention disclosure and to schedule the presentation of PM 9914 to Gilbarco's Patent Committee

4. In June 1999, I prepared PM 9914 to be presented by Timothy Dickson at Gilbarco's Patent Committee meeting. PM 9914 was presented by Timothy Dickson to the Gilbarco Patent Committee members in June 1999, and technical and commercial questions were fielded by Timothy Dickson and answered. Timothy Dickson was also a

member of the Gilbarco Patent Committee. The Gilbarco Patent Committee approved PM 9914 to be pursued for patent protection in the form of a patent application filed at the United States Patent and Trademark Office subject to a patentability search being conducted.

5. On or about July 1, 1999, I received an additional Patent Memorandum (Exhibit B) from Timothy Dickson illustrating additional information on alternative aspects of the present invention illustrated in PM 9914.

6. In July 1999, I directed the law firm of Coats and Bennett, PLLC to perform a patentability search and opinion for the contents of PM 9914 and the supplemental disclosure (Exhibit B). Coats and Bennett, PLLC scheduled a trip to the United States Patent and Trademark Office in Washington, D.C. to perform a patentability search and that such search was carried out in July 1999. The trip consisted of a search of prior art related to the present invention. Upon return back from the search trip, the references found during the search trip were ordered from a commercial patent service. The commercial patent service scheduled processing to provide such references and send such references by commercial mail.

7. In August 1999, the references were thereafter reviewed with respect to the present invention. The present invention was then reviewed again with respect to the references.

8. In September 1999, a patentability search report and opinion was dictated and reviewed for conciseness and clarity. The patentability search report was finalized and delivered my attention at Gilbarco. The patentability search report and opinion was delivered to me on or about September 27, 1999.

9. After receipt of the patentability opinion dated September 27, 1999, I reviewed this patentability opinion to determine the patentability of particular aspects of the invention disclosure of PM 9914, as well as worked with the inventor, Timothy E.

Dickson, to distinguish his invention from any prior art found at the United States Patent and Trademark Office.

10. After reaching the conclusion that the invention contained in PM 9914 was patentable, I directed the law firm of Coats and Bennett, PLLC after September 27, 1999 to begin preparation of a draft patent application for the invention contained in PM 9914.

11. Between September 27, 1999 and December 3, 1999, the law firm of Coats and Bennett, PLLC drafted a patent application for the invention contained in PM 9914.

12. On November 1, 1999, I left the employment of Gilbarco to begin working at the law firm of Coats and Bennett, PLLC.

13. On December 3, 1999, I sent a copy of a first draft of the patent application from the firm of Coats and Bennett, PLLC to the inventor, Timothy E. Dickson.

14. In December 1999 and January 2000, Timothy Dickson reviewed the patent draft application for his invention in PM 9914 and made comments and observations to me, and I incorporated such changes into the draft patent application.

15. On January 31, 2000, the application containing the invention described in PM 9914 was filed with the United States Patent and Trademark Office by me during my employment with Coats and Bennett, PLLC.

16. I hereby acknowledge that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. § 1001), and may jeopardize the validity of the application or any patent issuing thereon. All statements made herein are true and made on information and belief are believed to be true.

Steven N. Terranova

January 7, 2003
Date

Exhibit A

9914

April 21, 1999

Patent Memo - Fraud detection through inference

Problem - Fraud against liquid measuring devices that consists of a replacement of ~~some~~ portion of the device with a modified part of parts is becoming more prevalent and the attackers more sophisticated. This increases the difficulty of preventing/detecting fraud since the mechanisms responsible for that detection/prevention are often the mechanisms which are modified or replaced.

This increase in fraud results in larger and larger consumer losses, increasing cost of devices as anti-fraud mechanisms (usually mechanical) are added and a decrease in consumer confidence.

Solution - Provide a software based method of inferential fraud detection that does not depend on any fraud detection in the liquid measuring device itself. This technique would use a number of methods to infer potential fraud and alert appropriate individuals or authorities. Successfully countering one of the methods would not disable the fraud detection capability.

The approach would be to use normal system activity to spot abnormal activity that might indicate fraud. It depends on the fact that fraud will continue over a long time in order to get pay back for the effort and cost to introduce the fraud in the first place.

Since most gasoline retailing operations employ a central controller, that controller would be the focal point for data gathering, data analysis, and device/module authentication used in this multi-layer fraud detection scheme. Alternatively, data analysis could be done off site. This scheme could be used in addition to any fraud detection/prevention mechanisms in the liquid measuring device itself.

The fraud detection system could include, but not be limited to the following:

- Authentication of the dispensers software to detect modification. This can be done by a number of techniques already in the industry, such as use of cryptographic signatures.

- Monitoring and analysis of the vapor returned at a station or group of stations. Based on the level of efficiency of the vapor systems the amount of vapor returned on non-fraudulent fuel sales should significantly higher than fraudulent transactions.
- Monitoring of flow rates. The rate per gallon on average over all non-fraudulent transactions should significantly higher than the flow rate exhibited during fraudulent sales. This would be determined by a comparison of the avg. flow rate versus the volume delivered. For example, if a non-fraudulent fuel sale of 10 gal. is delivered at an avg. of 8 gal. per minute, a fraudulent fuel sale of 8 gal. (but presented the consumer at 10 gal.) should exhibit a marked lower avg. flow rate, up to 20%).
- A similar or additional approach could be to measure the time of the fuel delivery at each fueling position and watch for a change or consistently faster time per gal. indicating a fraudulent device.
- Monitor for increases or decreases in flow rate at a dispenser which do not match the overall pattern for the rest of the dispensers at the site.
- Contrast Tank Monitor (or even probe data) measurements against volume reported dispensed by the liquid measuring device whenever that device is the sole device in operation.
- Preload a set of norms for a station of like configuration that is know to contain now fraudulent data. This data can then be used to compare against the equipment on that site.
- In order to guard against a site in which all units are modified in the same manner at the same time. Data collected could be sent to a central location that is used to compare that site's data against either a control data set or a large number of sites.
  - Lack of data from any site would also indicate a potential fraud situation.

Exhibit B

To: Steve Terranova
From: Tim Dickson

Patent Memo – Fraud detection through inference
Additional information added 7/1/99

Problem - Fraud against liquid measuring devices that consists of a replacement of some portion of the device with a modified part of parts is becoming more prevalent and the attackers more sophisticated. This increases the difficulty of preventing/detecting fraud since the mechanisms responsible for that detection/prevention are often the mechanisms which are modified or replaced.

This increase in fraud results in larger and larger consumer losses, increasing cost of devices as anti-fraud mechanisms (usually mechanical) are added and a decrease in consumer confidence.

Solution - Provide a software based method of inferential fraud detection that does not depend on any fraud detection in the liquid measuring device itself. This technique would use a number of methods to infer potential fraud and alert appropriate individuals or authorities. Successfully countering one of the methods would not disable the fraud detection capability.

This methodology has been used successfully by the credit card industry to detect fraud in credit card usage at the point of sale.

The general approach would be to use normal system activity or a reference model to spot abnormal activity that might indicate fraud. It depends on the fact that fraud will continue over a long time in order to get pay back for the effort and cost to introduce the fraud in the first place, thus producing a statistically significant signature. Something similar has been done in the tank monitor arena to use operational statistics gathered over time to indicate potential leaks.

Since most gasoline retailing operations employ a central controller, that controller would be the focal point for data gathering, data analysis, and device/module authentication used in this multi-layer fraud detection

scheme. Alternatively, data analysis could be done off site. Most of the data referenced here is already available in retail petroleum systems or could be easily made available to populate the statistical models. This scheme could be used in addition to any fraud detection/prevention mechanisms in the liquid measuring device itself.

The fraud detection system could include, but not be limited to the following:

1. Authentication of the dispensers software to detect modification. This can be done by a number of techniques already in the industry, such as use of cryptographic signatures. The metrologically significant portions of the software in the dispenser could be cryptographically signed such that if modified the correct signature could not be returned to an on-site, or off-site, monitoring device upon request.

2. Monitoring and analysis of the vapor returned at a station or group of stations. Based on the level of efficiency of the vapor systems the amount of vapor returned on non-fraudulent fuel sales should significantly higher than fraudulent transactions. Detection of this would require measuring the amount of vapor returned per gallon displayed to the consumer. This value should be relatively constant during non-fraudulent deliveries. If the amount of vapor being returned dipped significantly it would indicate either a problem with the vapor system or potential fraudulent activate where the dispenser was delivering less volume to the consumer than was being displayed on the dispener.

   Monitoring more than one station would provide a larger database and make it possible to more accurately discriminate potential fraudulent activity from normal variations in the vapor system or vapor systems operating incorrectly.

3. Monitoring of flow rates. The rate per gallon on average over all non-fraudulent transactions should significantly higher than the flow rate exhibited during fraudulent sales. This would be determined by a comparison of the avg. flow rate versus the volume delivered. For example, if a non-fraudulent fuel sale of 10 gal. is delivered at an avg. of

8 gal. per minute, a fraudulent fuel sale of 8 gal. (but presented the consumer at 10 gal.) should exhibit a marked faster avg. flow rate, up to 20%). The flow rate, gallons delivered /time of delivery = avg. flow rate, should remain relatively constant for any given dispenser.

4. A similar or additional approach could be to measure the time of the fuel delivery at each fueling position and watch for a change or consistently faster time per gal. indicating a fraudulent device.

   A sudden increase in the average flow rate either from transaction to transaction or for extended periods would indicate potential fraud, especially if a unit capable of 10 GPM max. suddenly is delivering 12.5 GPM which would be the result of the calculation in a situation where the dispenser has been modified to deliver only 8 gallons while displaying 10 to the consumer.

   One embodiment would be to have the time variable of the calculation supplied by the station controller making it very difficult to prevent detection of the change in rate of delivery.

5. Monitor for increases or decreases in flow rate at a dispenser which do not match the overall pattern for the rest of the dispensers at the site. If only one, or several, of the dispensers at the site are being operated in a fraudulent manner, their pattern of operation will be different when compared to the other dispensers, of the same model, on the site.

6. Contrast Tank Monitor (or even probe data) measurements against volume reported dispensed by the liquid measuring device whenever that device is the sole device in operation. When a single pump is delivering, the accuracy level of current tank monitors is such that even the occurrence of a single "short delivery" of 20% may be detectable for a 10 or 15 gallon deliver.

7. Preload a set of norms for a station of like configuration that is know to contain now fraudulent data. This data can then be used to compare